

South Coast On-Road Heavy-Duty Vehicle Incentive Measure

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Executive Summary

In March 2017, the California Air Resources Board (CARB or Board) adopted the South Coast *Air Quality Management Plan* (AQMP) and the CARB *2016 State Strategy for the State Implementation Plan* (State SIP Strategy). The State SIP Strategy contains the State's emission reduction commitment for the South Coast Air Quality Management District (South Coast or District) including commitments for the South Coast Air Basin (Basin) federal 80 parts per billion (ppb) 8-hour ozone standard in 2023. The State SIP Strategy provides a statewide framework for measures to reduce emissions from mobile sources, fuels, and consumer products. The AQMP provides the technical foundation for the overall control strategy, local measures for stationary sources, and complementary efforts to help achieve reductions from mobile sources. Together, these two planning efforts comprise a comprehensive State Implementation Plan (SIP).

While regulations form the basis of this strategy, and are critical to drive technology development and deployment of the cleanest technologies into the fleet, incentive efforts are needed to expedite deployment of these cleaner technologies in time to achieve the standards. Therefore, the State SIP Strategy committed CARB to develop and propose for Board adoption a measure entitled, *Incentive Funding to Achieve Further Emission Reductions from On-Road Heavy-Duty Vehicles* (South Coast Incentive Measure), to achieve emission reductions specifically in 2023 through existing incentive funding programs to help increase the penetration of near-zero and zero-emission heavy-duty trucks.

By bringing the South Coast Incentive Measure to the Board, the State fulfills the commitment for Board consideration and demonstrates how an increment of emission reductions from incentive programs will be quantified towards the State's aggregate commitment in the SIP. The U.S. Environmental Protection Agency (U.S. EPA) guidance requires that all SIP measures meet specific requirements to be credited toward the SIP. The South Coast Incentive Measure meets these requirements. CARB staff partnered with District staff to identify categories of trucks, captive in the Basin, to turn over using 2019 through 2022 funding and achieve the first ton of emission reductions from this effort. In addition, CARB encourages the District to prioritize these emission reductions in low-income and disadvantage communities potentially providing co-benefits for the implementation of Assembly Bill (AB) 617. The South Coast Incentive Measure is intended to be a template for CARB and districts to prospectively take credit in the SIP for reductions from incentive programs. CARB anticipates future submittals pursuing SIP emission reduction credit in 2023 from incentive programs for the Basin.

The following table summarizes the South Coast Incentive Measure commitment.

Source Category: On-Road Heavy-Duty Vehicles	
Implementing Agency: CARB and South Coast Air Quality Management District	
Type of Action: Prospective Incentive-based Emission Reduction Measure	
2023	
NOx Emission Reductions	1.0 tpd
Number of On-Road, Heavy-Duty Repower and Replacement Projects	1,300 projects

I. Introduction

California has some of the worst air quality in the nation. Statewide, about 12 million Californians live in communities that exceed federal ozone and PM_{2.5} standards. Areas that do not attain the standard are designated as nonattainment and classified according to the severity of their air quality problem. Areas with higher pollution levels are given more time to meet the standard, but are also subject to more stringent control requirements. The Basin is one of the only two areas in the nation with an Extreme classification for the 80 ppb 8-hour ozone standard.

Considerable air quality progress has been made in the Basin due to ongoing emission reductions and coordination between the District, CARB, and U.S. EPA. The progress has been achieved through SIPs and control programs. The number of days over the 80 ppb 8-hour ozone standard in the Basin has been cut in half since 1990. While the ozone trends show significant improvement through this period, further reductions are needed to meet the standard. California's mobile source control programs have achieved and will continue to achieve significant oxides of nitrogen (NO_x) emission reductions. Ongoing implementation of these programs provides a significant down payment for meeting air quality standards.

Also, AB 617 recognizes that while California has seen tremendous improvement in air quality, some communities still suffer greater impacts than others. Communities near ports, railyards, warehouses, and freeways, for example experience significantly higher air pollution than other areas due to emissions from mobile sources such as cars, trucks, and locomotives. AB 617 prioritizes new efforts to address cumulative impacts in these communities and this effort will support AB 617 goals.

To address regional air quality, the Clean Air Act (Act) sets out requirements for adoption of air quality standards, as well as the required elements of SIPs, which must demonstrate how a nonattainment area, such as the Basin, will meet the standards by the required attainment deadline. Responsibility for developing and implementing a SIP is shared between CARB and districts. For nonattainment areas, the Act requires local air districts and the State to develop cohesive multi-year plans or SIPs to define actions needed to meet the standards. The air quality plans include various programs to reduce emissions from stationary, area, and mobile sources. Traditionally, SIPs relied on rules and regulations to improve air quality. However, to meet air quality standards in the Basin, rules and regulations must be supplemented with innovative efforts to accelerate deployment of the cleanest technologies in time to achieve the standards.

In March 2017, CARB adopted the South Coast AQMP that included the SIP demonstrating how the Basin will achieve the federal 80 ppb 8-hour ozone standard in 2023. The AQMP incorporates emissions reductions from the State SIP Strategy also adopted in March 2017. The State SIP Strategy provides a statewide framework for measures to reduce emissions from mobile sources, fuels, and consumer products.

The AQMP provides the technical foundation for the overall control strategy, local measures for stationary sources, and complementary efforts to help achieve reductions from mobile sources. Together, these two planning efforts comprise a comprehensive SIP which was submitted to U.S. EPA.

While regulations form the basis of the strategy, and are critical to drive technology development and deployment of the cleanest technologies into the fleet, incentive efforts are needed to expand deployment of these cleaner technologies in time to meet the standards. As part of the State SIP Strategy, CARB committed to develop and propose for Board action a series of defined new emission reduction measures, and to achieve aggregate emission reductions by certain dates. While the State SIP Strategy included estimates of emission reductions from each of the individual new measures, CARB's overall commitment is to achieve the total emission reductions necessary to attain the federal air quality standards, reflecting the combined reductions from the existing control strategy and new measures. Therefore, each measure may get more or less reductions than those estimated, but the State is still committed to achieving the total aggregate emission reductions identified in the State SIP Strategy.

This submittal fulfills the State commitment to propose the South Coast Incentive Measure for Board consideration and demonstrates how an increment of emission reductions from incentive programs will be quantified toward the State's aggregate commitment to achieve the necessary emission reductions. CARB staff partnered with District staff to identify categories of trucks, captive in the Basin, to turn over using 2019 through 2022 funding and achieve the first ton of emission reductions from this effort. California will employ many incentive programs throughout the implementation of the State SIP Strategy and district attainment plans. Historically, emission reductions achieved from incentive programs were credited towards the SIP retrospectively. The South Coast Incentive Measure is the first prospective SIP-creditable incentive measure of its kind and will serve as a template for future submittals by CARB and districts pursuing SIP emission reduction credit from incentive programs.

To develop the South Coast Incentive Measure, staff identified two captive fleets operating in the Basin to achieve one ton per day of NO_x emission reductions. The reductions will be credited against CARB's 2023 aggregate emission reduction commitment for the 80 ppb 8-hour ozone standard in the Basin. Of course, many additional opportunities to achieve the remaining emission reductions are available in the Basin and staff will continue to identify the remaining emission reductions needed to meet California's commitment.

U.S. EPA guidelines outline the requirements states need to meet in order for emission reductions from incentive projects to be SIP-creditable. The measure must demonstrate an established funding source and legal authority to implement; and emission reductions must be surplus to other requirements in a SIP, permanent, quantifiable, and enforceable.¹ For a prospective incentive measure, U.S. EPA guidelines also require that the measure include a publicly-enforceable commitment to achieve the reductions. The South Coast Incentive Measure meets these requirements as detailed in this report.

To ensure the South Coast Incentive Measure emission reductions occur, the District and CARB will take extra reporting and tracking precautions to ensure that the program is successful and delivers the reductions needed. The public will be able to calculate the emission reductions using widely available methods and assumptions, and in a manner that can be replicated. U.S. EPA and the public will be able to determine whether emission reductions attributed to a project adequately cover the period for which those reductions are credited in a SIP.

On September 19, 2017, CARB staff held an online, public workshop to introduce the South Coast Incentive Measure and receive public input on the development of the measure. This draft South Coast Incentive Measure reflects comments that may have been received. After a 30-day public review, the Board will consider the South Coast Incentive Measure at its hearing on March 22, 2018. If adopted, CARB staff will submit the South Coast Incentive Measure to U.S. EPA as a revision to the California SIP.

II. Funding and Legal Authority for the South Coast Incentive Measure

To ensure that incentive emission reductions can be credited to the SIP in a future year, U.S. EPA requires incentive measures to have an established funding source. The South Coast Incentive Measure established funding source is the Carl Moyer Memorial Air Quality Standards Attainment Program (Moyer Program).

In 1998, California established the Moyer Program when \$25 million was added to the fiscal year 1998-1999 State budget to incentivize lower-emission heavy-duty engines. CARB adopted the first set of Moyer Program guidelines in early 1999, and legislation enacted in 1999 formally established the statutory framework for the Moyer Program (Health and Safety Code section 44275, et seq.). The program initially focused on reducing NOx emissions from heavy-duty diesel engines to implement a strategy in the 1994 California SIP that called for early introduction of cleaner engines. The scope of the program has expanded over the years with statutory changes adding targeted pollutants and new source categories.

¹ See “Guidance on Incorporating Voluntary Mobile Source Emission Reduction Programs in State Implementation Plans (SIPs),” October 24, 1997, at page 6-7; “Improving Air Quality with Economic Incentive Programs,” January 2001 at Section 4.1; “Incorporating Emerging and Voluntary Measures in a State Implementation Plan (SIP),” September 2004 at pages 3-4; and “Diesel Retrofits: Quantifying and Using Their Emission Benefits in SIPs and Conformity,” February 2014 at pages 27-29.

Legislation enacted in 2004 (AB 923, Firebaugh), SB 1107 (Committee on Budget and Fiscal Review), and AB 1394 (Levine) provided increased and continued funding, while significantly expanding the Moyer Program. AB 923 expanded the Moyer Program to include light-duty vehicle projects and agricultural sources of air pollution as defined in Health and Safety Code section 39011.5(a). Specifically, AB 923 adjusted the tire fee that is assessed on purchasers of new tires. SB 1107 established the smog abatement fee as a funding source, increased the smog abatement fee collected for new registered vehicles, and eliminated a sunset date. Smog abatement fees are collected for new vehicles registered by the Department of Motor Vehicles. Additional legislation enacted in 2004, AB 1394 (Levine), directed CARB to include in the Moyer Program heavy-duty fleet modernization projects that reduce NO_x and/or PM₁₀ emissions through the replacement of old trucks.

The Moyer Program was re-authorized in 2013 (AB 8, Perea), with full funding extended through 2023. The Legislature substantially augmented the Moyer Program in 2015 (SB 513, Beall) with new provisions related to cost-effectiveness, fund leveraging, and infrastructure funding. CARB approved updated 2017 Moyer Program Guidelines at its April 2017 board hearing (2017 Guidelines) to address these legislative changes.

Although the Moyer Program has grown in scope, it retains its primary objective of obtaining cost-effective and surplus emission reductions to be credited toward California's legally-enforceable obligations in the SIP. While following the public process, multiple changes have been made to the program guidelines in response to legislative and regulatory changes. Guideline changes also ensured that emission reductions funded through the Moyer Program are consistent with the underlying statutory mandates by being "permanent, surplus, quantifiable, and enforceable." CARB is required to make proposed changes to the guidelines available to the public at least 45 days prior to final adoption and is required to hold at least one public meeting to consider public comments before final adoption of any changes. Later sections of this document will demonstrate how the South Coast Incentive Measure follows the 2017 Guidelines for SIP creditability.

The Moyer Program has been a successful and popular air quality program. Since the Moyer Program began in 1998 nearly \$1 billion in Moyer Program incentive grants have been used to clean up over 60,000 older engines in California. This has reduced NO_x and ROG emissions by more than 183,000 tons, and particulate matter by more than 6,700 tons statewide.

The Moyer Program has been implemented through the cooperative efforts of CARB and the districts. The Health and Safety Code directs CARB to oversee the Moyer Program by managing program funds; developing and revising guidelines, protocols, and criteria for covered vehicle projects; and determining methodologies used for evaluating project cost-effectiveness. CARB distributes State funds to the districts for program implementation each year. The 2017 Guidelines describe requirements for

administrative procedures, eligibility criteria for projects in different source categories, cost-effectiveness criteria, and reporting practices. Districts, following the criteria approved in the Board-approved guidelines, provide grants to public and private entities for the incremental cost of cleaner-than-required engines, vehicles, equipment, and emission reduction technologies. The districts follow the 2017 Guidelines to select, fund, and monitor the specific clean air projects within their boundaries.

The districts have flexibility in implementing the Moyer Program. For example, districts may focus their Moyer Program funds on different vehicle categories such as on-road or off-road heavy-duty vehicles. This flexibility allows districts to tailor the use of the Moyer Program funds to meet local air quality objectives while ensuring proper and responsible use of State funds.

All California air pollution control and air quality management districts may apply for Moyer Program funds. The allocation of Moyer Program funds reflects updated information on district population and air pollution severity under Health and Safety Code section 44299.2. Of the \$69 million in Moyer Program funds currently authorized statewide from smog abatement and tire fees, South Coast was allocated \$26.3 million in fiscal year 2017-18.²

Districts participating in the Moyer Program are required to provide matching funds. The district's match requirement is 15 percent of the district's final Moyer Program allocation; districts requesting only the minimum allocation of \$200,000 are exempt from the match requirement. The district can meet its match obligation through funding from a combination of committed projects not used as match for a previous grant; future projects with this in-kind contribution (funds under the air districts budget authority) must be limited to not more than 15 percent of the total match commitment. All projects used to meet match requirements must also follow the 2017 Guidelines. Based on an allocation in the South Coast of \$26.3 million for fiscal year 2017-18, the District is required to provide \$3.9 million in match funds for a total of \$30.2 million.

To ensure that emission reductions span the entire 2023 calendar year from January 1 to December 31, 2023, the project life must also span that time period. Thus, projects implemented during the 2019 to 2022 calendar year with a five-year project life will be eligible for this measure. The 2019 to 2023 five year timeframe was chosen because historically five years is the typical contract length even though the 2017 Guidelines allow up to a seven-year project contract.

² The recent passage of AB 1274 (O'Donnell, 2017) will provide up to 70 percent higher funding for the Carl Moyer Program in the coming years. In addition, through AB 134 the fiscal year 2017-18 State Budget allocated another \$107.5 million Greenhouse Gas Reduction Funds to South Coast for projects that meet Carl Moyer or Goods Movement Emission Reduction Program requirements.

For this measure, the estimated emission reductions and number of projects in the 2019 through 2022 timeframe are limited to the amount of funding available to the District. The South Coast Incentive Measure utilizes established Moyer Program funding and assumes the 2017 Guideline maximum funding limits per project. These factors produce a conservative number of projects and resulting emission reductions.

CARB staff has determined that the Moyer Program provides appropriate legal authority and established funding for the South Coast Incentive Measure. To ensure that the projects satisfy U.S. EPA's integrity demonstration elements and are SIP creditable, the South Coast Incentive Measure will follow the 2017 Guidelines dated April 27, 2017 as they apply to on-road, heavy-duty vehicle projects. The references listed below provide links to the applicable guidelines.

- 2017 Moyer Program, Volume I: *Program Overview, Program Administration, and Project Criteria*
https://www.arb.ca.gov/msprog/moyer/guidelines/2017gl/2017_cmp_gl_volume_1.pdf
- South Coast Air Quality Management District 2017 Carl Moyer Memorial Air Quality Standards Attainment Program, Program Announcement, Year 19, SCAQMD Program Announcement #PA2017-04
<http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2017/2017-apr7-006.pdf?sfvrsn=4>

III. The South Coast Incentive Measure Emission Reductions are Surplus

In 2008, the Board adopted the Truck and Bus Regulation³. This Regulation applies to the one million on-road, heavy-duty diesel vehicles operating in California with a gross vehicle weight greater than 14,000 pounds. The Truck and Bus Regulation requires nearly all diesel trucks and buses that operate in California to be upgraded to meet the 0.2 g/bhp-hr NOx engine standard by January 1, 2023. The 0.2 g/bhp-hr NOx new engine standard was adopted by U.S. EPA for all 2010 or newer model year engines (2010 Engine Standard). To comply with the Truck and Bus Regulation, fleet owners must transition from older higher-emitting vehicles to newer lower-emitting vehicles that meet the 2010 Engine Standard.

In 2013, the Board adopted optional Low-NOx emission standards⁴ for on-road, heavy-duty engines to encourage manufacturers to introduce new technologies to reduce NOx emissions below the current standard. The optional Low-NOx engine standards allow engines to be certified to 0.1 g/bhp-hr, 0.05 g/bhp-hr, and 0.02 g/bhp-hr

³ Truck and Bus Regulation, <https://www.arb.ca.gov/msprog/onrdiesel/onrdiesel.htm>

⁴ Optional Reduced engine s for Heavy-Duty Engines, Section 1956.8
<https://www.arb.ca.gov/regact/2013/hdghg2013/hdghg2013.htm>

NOx emissions. These Low-NOx engines produce emission reductions beyond what is required by the mandatory Truck and Bus Regulation and are considered surplus.

The South Coast Incentive Measure targets captive fleets operating in the Basin such as solid waste collection vehicles (refuse trucks) and drayage trucks that operate at the ports of Los Angeles and Long Beach. U.S. EPA defines emission reductions as surplus when they are not otherwise required by regulations or legal mandates, any other state or local air quality program, a consent decree, or a federal rule designed to reduce criteria pollutant or precursor emissions. Also, emission reductions are surplus only for the remaining useful life of the vehicle, engine, or equipment being replaced. For the South Coast Incentive Measure, surplus emission reductions will be achieved through engines that are cleaner than the 2010 Engine Standard. If zero emission technologies are commercially available within the measure timeframe, those technologies could be employed to achieve even greater emission reductions.

Through this measure, vehicles with a 2009 or older certified engine will be replaced or repowered with a certified Low-NOx engine that is cleaner than the current 2010 Engine Standard. Refuse trucks are envisioned to be the first eligible projects because there is currently a certified and commercially-available Low-NOx engine that is appropriate for this use. A Low-NOx engine appropriate for a drayage truck is expected to be certified and commercially-available by 2019.

For drayage truck replacement projects, the surplus emission reductions are the emission reductions above and beyond the current 2010 Engine Standard that is required by the Truck and Bus Regulation and already accounted for in the baseline SIP inventory. However, since pre-2007 refuse trucks are exempt from the Truck and Bus Regulation and the Solid Waste Collection Vehicle Rule⁵ (SWCV Rule) only addresses particulate matter emissions, all NOx emission reductions associated with the replacement and repower of refuse trucks are surplus. To prevent double-counting from these regulations, all projects will be cross-referenced to ensure that credited reductions are not relied upon in other SIP measures.

The requirement for projects funded through the Moyer Program to provide surplus emissions reductions is codified in Health and Safety Code section 44281(b). The following references provide details on how the 2017 Guidelines ensure that emission reductions generated by these projects are not required by any regulation for the duration of the life of the project and the replacement equipment will be operated in the Basin. The 2017 Guideline sections listed below set exclusive requirements for funded projects and ensure that the emission reductions from projects funded under the Moyer Program must not be used for any other emission reduction obligations. Therefore, emission reductions achieved from these projects are not required by any other regulations.

⁵ Solid Waste Collection Vehicle Rule, <https://www.arb.ca.gov/msprog/swcv/swcv.htm>

- 2017 Moyer Program, Volume I, Chapter 2: *General Criteria*, A–D and F–H
- 2017 Moyer Program, Volume I, Chapter 4: *On-Road Heavy-Duty Vehicles*, Section A. *Projects Eligible for Funding*
- 2017 Moyer Program, Volume I, Chapter 4: *On-Road Heavy-Duty Vehicles*, Section C. *Project Criteria*, 1. *General Criteria*, (D) *Compliance Check*; 2. *Project Categories and Applicable Project Types*

The 2017 Guideline sections listed below require the emission reductions to occur in California. Further, the District requires applicants to operate (annual miles or hours of operation) at least 75 percent within the District. This requirement ensures the resulting emission reductions will occur in the District. To ensure the old engine or vehicle is comparable to its replacement, the 2017 Guidelines have usage-to-usage requirements for horsepower, weight class, and body axle configuration. These requirements prevent loss in emission reductions from a larger, higher emitting engine. This criteria supports the surplus integrity element by verifying that emissions reductions are occurring in the Basin.

- 2017 Moyer Program, Volume I, Chapter 2: *General Criteria*, Section S
- South Coast Carl Moyer Program Announcement #2017-04, *Work Statement* (pg.14), *Deliverables* (pg.15), and *General Application Form A-1*
- 2017 Moyer Program, Volume I, Chapter 4: *On-Road Heavy-Duty Vehicles*, Section C. *Project Criteria*, 1. *General Criteria*, (J)
- 2017 Moyer Program, Volume I, Chapter 4: *On-Road Heavy-Duty Vehicles*, Section C. *Project Criteria*, 3. *Participant Requirements*, (B)
- 2017 Moyer Program, Volume I, Chapter 4: *On-Road Heavy-Duty Vehicles*, Section C. *Project Criteria*, 4. *Existing Engine and Vehicle Requirements*, (C)
- 2017 Moyer Program, Volume I, Chapter 4: *On-Road Heavy-Duty Vehicles*, Section C. *Project Criteria*, 5. *Replacement Engine and Vehicle Requirements*, (E), (F), and (G)
- Pg. 20-21, 75 percent South Coast <http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2017/2017-apr7-006.pdf?sfvrsn=4>

This measure goes beyond the Truck and Bus Regulation and Solid Waste Collection Vehicle Rule because it will provide incentives to purchase engines that meet the optional CARB Low-NOx engine standards instead of the required 2010 Engine Standard. Based on the above, this measure meets the criteria for emissions reductions to be “surplus” as defined by U.S. EPA guidance.

IV. The South Coast Incentive Measure Emission Reductions are Permanent

Projects funded through the Moyer Program must follow specific guidelines to ensure that the emission reductions are permanent. Project participants enter into a contract with the District that establishes the project details. The replaced vehicle or engine must be operational at the time of replacement and the new engine or vehicle must remain in service for the entire contract term, which must extend to the end of the project life. The replaced engine or vehicle must be destroyed. Visual inspections ensure that these requirements are met and audits validate the information provided by the project grantee.

Emission reductions from incentive programs are considered permanent if the state and U.S. EPA can ensure that emission reductions are achieved for the entire period that is credited in the SIP. The references in this section assure that the emission reductions in this measure are achieved in the South Coast throughout the life of the project which must cover the entire year in which SIP credit is given. Additionally, the projects are monitored throughout the contract and project life.

Recordkeeping, reporting, and application requirements further ensure that historic and future emissions are estimated correctly and properly represented. Pre- and post-inspection references include requirements ensuring the equipment information provided by the project owner is consistent with actual operating equipment and that the existing engine is in usable form and would not have been replaced by natural fleet turnover. These requirements ensure the replaced engine or vehicle is operational and working as described, and the new engine or vehicle has been installed and is ready for use. These requirements ensure that emission reductions from these projects are realized and beyond the normal fleet turnover assumed in the SIP inventory.

- 2017 Moyer Program, Volume I, Chapter 3: *Program Administration*, T. *Application Evaluation and Project Selection*, 4. *Application Tracking* and 8. *Recordkeeping*
- 2017 Moyer Program, Volume I, Chapter 3 *Program Administration*, Z. *Grantee Annual Reporting*
- 2017 Moyer Program, Volume I, Chapter 3: *Program Administration*, W. *Project Pre-Inspection*; X. *Project Post-Inspection*

The 2017 Guideline sections listed below require verification that the replaced vehicle or engine is destroyed to ensure it is not reused, the new vehicle or engine is operational, and the resulting emission reductions are permanent. The following references specify the requirements for destroying and dismantling the replaced equipment.

- 2017 Moyer Program, Volume I, Chapter 2 *General Criteria*, H
- 2017 Moyer Program, Volume I, Chapter 3: *Program Administration*, Section X. *Project Post-Inspection*, 1. *Requirement*; 4. *Verification of Destruction*

- 2017 Moyer Program, Volume I, Chapter 4: *On-road Heavy-Duty Vehicles*, Section C. *Project Criteria*, 8. *Dismantler Requirements*, (A); (C)

The 2017 Guideline sections listed below ensure the emission reduction calculations are based on information originating from the grantee's application, and contractually hold the grantee accountable for the validity of the information provided.

- 2017 Moyer Program, Volume I, Chapter 3: *Program Administration*, W. *Project Pre-Inspection*; X. *Project Post-Inspection*
- 2017 Moyer Program, Volume I, Chapter 4: *On-road Heavy-Duty Vehicles*, Section C. *Project Criteria*, 3. *Participant Requirements*, (G); (H)
- 2017 Moyer Program, Volume I, Chapter 4: *On-road Heavy-Duty Vehicles*, Section C. *Project Criteria*, 6. *District Requirements*, (H) *Inspections*
- 2017 Moyer Program, Volume I, Chapter 4: *On-road Heavy-Duty Vehicles*, Section C. *Project Criteria*, 8. *Dismantler Requirements*, (C)

The 2017 Guideline sections listed below ensure that the emission reductions are permanent throughout the life of the contract between the grantee, District, and dealership/installer. These contract provisions ensure the emissions reductions are permanent.

- 2017 Moyer Program, Volume I, Chapter 3 *Program Administration*, AA. *Air District Audit of Projects*
- 2017 Moyer Program, Volume I, Chapter 4: *On-road Heavy-Duty Vehicles*, Section C. *Project Criteria*, 3. *Participant Requirements*, (G)
- 2017 Moyer Program, Volume I, Chapter 4: *On-road Heavy-Duty Vehicles*, Section C. *Project Criteria*, 6. *District Requirements*, (H); (J)
- 2017 Moyer Program, Volume I, Chapter 4: *On-road Heavy-Duty Vehicles*, Section C. *Project Criteria*, 7. *Dealership/Installer Requirements*, (E)

The provisions discussed in this section are sufficient to ensure that the emission reductions generated through the Moyer Program meet the criteria for emission reductions to be "permanent" as defined by U.S. EPA guidance.

v. The South Coast Incentive Measure Emission Reductions are Quantifiable

Emissions reductions are quantifiable if they can be reliably measured or determined, as well as replicated. The South Coast Incentive Measure will follow the methodology in the 2017 Guidelines to calculate emission reductions and maintain a publicly-accessible database with the information needed for the calculations.

The following references demonstrate that the 2017 Guidelines ensure that the data provided by the applicant in the CARB database is sufficient to accurately determine the

emission reductions; the emission factors, as well as all formulas and instructions to calculate emission reductions are publicly available, current and accurate; and that procedures are in place to ensure projects are completed and emission reductions are achieved. For the South Coast Incentive Measure, emissions benefits will be calculated in a database and emission factors and calculation methodologies will be maintained by CARB. These factors and methodologies will be made available to the public through a publicly available spreadsheet at <https://www.arb.ca.gov/planning/sip/imp2016sip/imp2016sip.htm>.

The 2017 Guidelines, Volume I, Chapter 3: *Program Administration*, T. *Application Evaluation and Project Selection*, 4. *Application Tracking* and 8. *Recordkeeping*, require the District to report project information to CARB sufficient to populate the required data fields and to calculate covered emission reductions and cost effectiveness. To verify the validity of the projects, the information listed below will be collected, publicly available, and reported to U.S. EPA so the individual projects can be identified and the public can calculate the resulting emission reductions. The District will ensure the information is complete, correct, and supported by documentation; while CARB will make the information available to the public at <https://www.arb.ca.gov/planning/sip/imp2016sip/imp2016sip.htm>. CARB and the District will retain records for five years after the attainment deadline.

Unique project and equipment identification including:

- Project number
- Project title
- Equipment identifier
- Vehicle identification number (VIN)

Project information including:

- Source category (on-road)
- Equipment technology (repower or replacement)
- Equipment type (refuse, drayage, etc.)
- Fleet size
- Gross vehicle weight rating (GVWR)
- Activity information (miles/gallons/hours)
- Percentage operated in California and District

Old vehicle and engine information including:

- Vehicle model year
- Vehicle fuel type
- Number of engines replaced
- Engine model year(s)

Replacement vehicle and engine information including:

- Vehicle model year
- Fuel type
- Engine emission level(s)
- Number of engines replaced
- Engine model year(s)

Administrative information including:

- Project life
- Contract executive date or voucher approval date
- Post-inspection date

NOx emission reductions (tpd)

The following sections from the 2017 Guidelines describe the elements that are vital to properly quantify emission reductions, such as project type, project life, usage, emission reduction equations, and emission factors.

- 2017 Moyer Program, Volume I, Chapter 4: *On-road Heavy-Duty Vehicles*, Section A. *Project Eligible for Funding*, 1. *Vehicle Project Types*, (A) *Vehicle Replacements*; (B) *Repowers*
- 2017 Moyer Program, Volume I, Chapter 4: *On-road Heavy-Duty Vehicles*, Section B. *Determining Funding Amounts*, 4. *Project Life*
- 2017 Moyer Program, Volume I, Chapter 4: *On-road Heavy-Duty Vehicles*, Section C. *Project Criteria*, 1. *General Criteria*, (C)
- 2017 Moyer Program, Volume I, Chapter 4: *On-road Heavy-Duty Vehicles*, Section C. *Project Criteria*, 2. *Project Categories and Applicable Project Types*, (A) *Heavy-Duty Trucks and Buses (Non-drayage)*; (D) *Drayage Trucks*; (E) *Solid Waste Collection Vehicles*
- 2017 Moyer Program, Volume I, Appendix C *Cost-Effectiveness Calculation Methodology*,
- 2017 Moyer Program, Volume I, Appendix D *Tables for Emission Reduction and Cost-Effectiveness Calculations*

The 2017 Guidelines sections listed below identify the project life, emission factors, and deterioration rates that must be used to determine the emissions from the replaced and new vehicles or engines. While the 2017 Guidelines allow a maximum project life of seven years, the South Coast Incentive Measure assumes a project life of five years for both replacement and repower projects. These requirements ensure that the credited emission reductions will be based on the most current and accurate emission factors and deterioration rates.

- 2017 Moyer Program, Volume I, Chapter 4: *On-road Heavy-Duty Vehicles*, Section B. *Determining Funding Amounts*, 6. *Calculating Emissions*
- 2017 Moyer Program, Volume I, Chapter 4: *On-road Heavy-Duty Vehicles*, Section C. *Project Criteria*, 1. *General Criteria*, (C)
- 2017 Moyer Program, Volume I, Chapter 4: *On-road Heavy-Duty Vehicles*, Section B. *Determining Funding Amounts*, 4. *Project Life*
- 2017 Moyer Program, Volume I, Appendix D *Tables for Emission Reduction and Cost-Effectiveness Calculations*

The equations identified in Appendix C of the 2017 Guidelines, required specific data inputs to calculate the emission reductions from Moyer Program projects. The 2017 Guideline sections listed below establish the requirements for data input and documentation that grantees must provide. These requirements ensure the data is sufficient for calculating emission reductions.

- 2017 Moyer Program, Volume I, Chapter 2 *General Criteria*, H
- 2017 Moyer Program, Volume I, Chapter 3: *Program Administration*, W. *Project Pre-Inspection*, 2. *Documentation*
- 2017 Moyer Program, Volume I, Chapter 4: *On-road Heavy-Duty Vehicles*, Section C. *Project Criteria*, 1. *General Criteria*, (D) *Compliance Check*
- 2017 Moyer Program, Volume I, Chapter 4: *On-road Heavy-Duty Vehicles*, Section C. *Project Criteria*, 3. *Participant Requirements*, (B)
- 2017 Moyer Program, Volume I, Chapter 4: *On-road Heavy-Duty Vehicles*, Section C. *Project Criteria*, 4. *Existing Engine and Vehicle Requirements*; 5. *Replacement Engine and Vehicle Requirements*

The quantified 2023 emission reductions for this measure will be calculated using the methodology in the 2017 Guidelines. The 2017 Guidelines specify formulas in Volume I, Appendix C: *Cost-Effectiveness Calculation Methodology* along with the emission factors from Volume I, Appendix D: *Tables for Emission Reduction and Cost-Effectiveness Calculations*. The appropriate formula and emission factors will be used for each project.

In **Appendix A - Methodology and Sample Calculations** to this document, Example 1 shows how the projected emission reductions of a drayage truck replacement project is estimated for this measure. Prospectively, Example 1 was used to calculate the one tpd of NO_x emission reductions from the replacement or repower of 1,300 trucks. Once the trucks have actually been replaced or repowered, Example 2 demonstrates how to calculate the emission reductions for an implemented project that replaced an older refuse truck with a new truck with an engine certified to a Low-NO_x engine standard. Example 2 demonstrates the calculations that will be used and reported to U.S. EPA.

Once the potential projects are identified, the amount of incentive funds available (\$30 million per year in this measure) define the number of projects that can be funded with this measure. The 2017 Guidelines allow up to \$40,000 per project for refuse truck

repower projects and \$100,000 for refuse trucks and drayage truck replacement projects with a Low-NOx engine. For a conservative estimate of total emission reductions achieved through this measure, staff assumed all projects would be funded at the maximum project funding levels of \$40,000 and \$100,000 while utilizing less than South Coast's estimated maximum \$30 million per year.

The provisions discussed in this section provide for well-established, publicly available emission factors and calculation methods. Therefore, emission reduction calculations for projects funded under the 2017 Guidelines are reliable and achieved through replicable methods. These provisions meet the criteria for emissions reductions to be "quantifiable" as defined by U.S. EPA guidance.

VI. The South Coast Incentive Measure is Enforceable

Emission reductions and required actions are enforceable if they are independently verifiable and practically enforceable consistent with U.S. EPA guidance; program violations are defined; those liable can be fined; the state or U.S. EPA may apply penalties and secure corrective action where applicable; citizens have access to all emission-related information obtained from participating sources; and U.S. EPA and/or citizens may take action against the state. The emission reductions achieved through this measure are enforceable because there will be an enforceable contract between the District and the participant, CARB will maintain a public database of information from these contracts, and CARB is the responsible party for enforcement of this measure and is responsible for achieving the emission reductions from this measure.

The following references detail requirements in the 2017 Guidelines for enforceable contracts, reporting by the grantee, and project inspections. In addition to validating data provided by the applicant, project inspections and audits ensure that contract requirements are met and that the purchased, replaced, and repowered technology type are consistent with the specifications in the contract.

The 2017 Guidelines sections listed below require the District to execute contracts for all selected projects. The 2017 Guidelines go further and describe repercussions for non-compliance with the obligations of the contract. Repercussions for noncompliance include, but are not limited to, cancelling the contract and recapturing project funds. CARB and the District have the authority to seek any remedies available under law for noncompliance. For this measure, each project will be under contract and subject to audit.

- 2017 Moyer Program, Volume I, Chapter 3 *Program Administration*, V. *Minimum Contract Requirements*, (5) *Contract Term*; (11) *Repercussions for Nonperformance*
- 2017 Moyer Program, Volume I, Chapter 4 *On-road Heavy-Duty Vehicles*, Section C. *Project Criteria*, 7. *Dealership/Installer Requirements*, (D)

- 2017 Moyer Program, Volume I, Chapter 4 *On-Road Heavy-Heavy Vehicles*, A. *Projects Eligible for Funding*, 1. *Vehicle Project Types*, (A) *Vehicle Replacements*; (B) *Repowers*
- 2017 Moyer Program, Volume I, Chapter 3 *Program Administration*, V. *Minimum Contract Requirements*, (10) *On-Site Inspections, Audits, and Records*

The 2017 Guideline sections listed below set forth the specific reporting criteria required of grantees. All contracts must include detailed information on the replaced and new vehicles or engines. The contracts must include a provision that grantees submit annual reports commencing no later than 18 months after project post-inspection and throughout the project implementation phase of the contract.

- 2017 Moyer Program, Volume I, Chapter 2 *General Criteria*, H
- 2017 Moyer Program, Volume I, Chapter 3 *Program Administration*, V. *Minimum Contract Requirements*, (6) *Project Specifications*; (9) *Reporting*
- 2017 Moyer Program, Volume I, Chapter 3 *Program Administration*, Z. *Grantee Annual Reporting*
- South Coast Carl Moyer Program Announcement #2017-04, *Work Statement* (pg.14), *Deliverables* (pg.15), and *General Application Form A-1*

The 2017 Guideline sections listed below describe the pre- and post-inspection requirements for funded projects. The visual inspections ensure the emission reductions are verifiable. These requirements ensure that the information provided by the grantee is as described, and confirm the new vehicle or engine is in working condition. As mentioned in the **IV. Permanent** section, all replaced vehicles or engines are destroyed and verified through the post-inspection process.

- 2017 Moyer Program, Volume I, Chapter 3 *Program Administration*, V. *Minimum Contract Requirements*, (10) *On-Site Inspections, Audits, and Records*
- 2017 Moyer Program, Volume I, Chapter 3 *Program Administration*, W. *Project Pre-Inspection*; X. *Project Post-Inspection*
- 2017 Moyer Program, Volume I, Chapter 4 *On-Road Heavy-Duty Vehicles*, Section C. *Project Criteria*, 4. *Existing Engine and Vehicle Requirements*, (G)
- C.6. *District Requirements*, (H) *Inspections*

To ensure that emission reductions span the entire 2023 calendar year from January 1 to December 31, 2023, the project life must span that time period. Thus, projects implemented during the 2019 to 2022 calendar year with a five-year project life will be eligible for this measure. Any project life that ends before or during the 2023 calendar year will not be eligible for SIP credit through this measure. Also, any project that is implemented during the 2023 calendar year will not be eligible for SIP credit through this measure.

Procedures for Public Disclosure of Information

There are three methods the public can use to access information relating to the South Coast Incentive Measure. The following provisions ensure that U.S. EPA and the public have access to emission data in accordance with the requirements of Clean Air Act section 114 and U.S. EPA implementing regulations in 40 CFR 2.301.

1. All documents created and/or used in implementing the requirements of the South Coast Incentive Measure, including emission reductions, shall be kept and maintained by the District and CARB through July 20, 2029 (five years past the July 20, 2024 attainment date) through the CARB database and District recordkeeping. Consistent with the California Public Records Act and other related requirements, such records shall be made available for public review upon request to CARB. Such documentation will include the list of project information referred to in the **V. Quantifiable** section of this measure.
2. Annual reports derived from the CARB database between 2020 and 2023 shall be submitted no later than March 31 of each respective year. The reports will include the quantity of emission reductions achieved through the SIP-creditable South Coast Incentive Measure. Submitted annual demonstration reports will be made available on CARB's website
<https://www.arb.ca.gov/planning/sip/imp2016sip/imp2016sip.htm>.
3. All inquiries to obtain this information may be directed to CARB's *Implementation of the State SIP Strategy* webpage at
<https://www.arb.ca.gov/planning/sip/imp2016sip/imp2016sip.htm>.

Provisions to Measure and Track Programmatic Results

Beginning in 2020, the annual reports will be available by March 31 on a CARB website dedicated to this measure. The reports and projects will be available to the public so any emission reductions credited towards this measure can be replicated.

CARB shall perform a retrospective assessment to evaluate the overall performance of the efforts toward this measure and develop recommendations for future enhancements to the Moyer Program implementation. The assessment will be included in the March 31, 2021 and March 31, 2023 reports, and will include the following:

- Project information and emission reductions from the CARB database for the refuse and drayage trucks put into operation during the time period provided;
- A comparison of projected rate of on-road, heavy-duty replacement and repower projects with actual rate of replacement and repower projects;
- A discussion of implementation difficulties and potential solutions; and
- A discussion of reasons for changing program guidelines, if any.

Additionally, State law provides CARB with oversight responsibilities and the authority to review incentive programs (Health and Safety Code sections 44291 and 39500) to ensure that those mobile source emission reduction incentive programs actually achieve the expected emission reductions. CARB is required to monitor district programs to ensure that they are conducted in a manner that is consistent with the Health and Safety Code, 2017 Guidelines and advisories, program grant award and authorizations, and local district requirements.

In addition to audits that focus primarily on the financial aspect of a program, State law prescribes a broader scope for CARB's monitoring of district incentive programs that include an evaluation of the eligibility of projects funded and the emission reductions achieved. As a consequence, CARB incentive program reviews must be performed by staff with technical expertise in emission reduction technologies for a variety of equipment types who are also conversant with State law and CARB program guidelines.

In addition to identifying program deficiencies, incentive program reviews provide CARB with a mechanism for identifying the strengths of district programs. These commendable efforts are shared with other districts and can thus be useful in improving the Moyer Program.

Enforceable Commitment

CARB and the District are partnering to implement the South Coast Incentive Measure using Moyer Program incentive funds and following the 2017 Guidelines. Through this partnership, the District will fund and implement the projects and CARB will track and report on progress to U.S. EPA. This partnership is vital to the success of meeting this incentive measure commitment.

The California Air Resources Board as the air pollution control agency for all purposes set forth in federal law will do the following:

1. Monitor district implementation of 1,300 on-road, heavy-duty compression ignition truck repower and replacement projects in accordance with the Carl Moyer Program Guidelines, 2017 Revisions, approved April 27, 2017, Volume I: Program Overview, Program Administration, and Project Criteria, chapters 2, 3, and 4;
2. By December 31, 2022, achieve one tpd of reductions in NO_x emissions from the 2023 baseline inventory, as detailed in the 2016 South Coast Air Quality Management Plan and discussed in the State SIP Strategy, through implementation of these projects or substitute measures for the Basin;
3. By March 31 of each year beginning in 2020 and through 2023, report annually to U.S. EPA the following information:

- a. Identify the portion of the 1,300 projects funded through the previous year by project identification number, project life and implementation date, description of both baseline and new equipment, applicable incentive program guideline, and quantified emission reductions;
 - b. Describe any changes to the 2017 Guidelines and related impacts on program integrity;
 - c. Document CARB and the District's actions to monitor selected projects for compliance with contract requirements; and
 - d. Determine whether the identified projects are projected to achieve the full one tpd of NOx emission reductions in the Basin in 2023;
4. Make each demonstration report publicly available or available by request; and
5. If U.S. EPA determines by July 1, 2021 that information submitted by CARB is insufficient to demonstrate that emission reductions required under Paragraph 2 will occur on schedule, adopt and submit to U.S. EPA, no later than September 1, 2022, substitute measures and/or rules that will achieve emission reductions addressing the shortfall as expeditiously as practicable and no later than January 1, 2023.

The contracting, reporting, and inspection provisions discussed in this section ensure that projects in this measure are independently verifiable and along with the CARB Enforceable Commitment meet the criteria for emission reductions to be "enforceable" as defined by U.S. EPA guidance.

VII. Environmental Impacts

This section provides the basis for CARB's determination that the proposed measure is exempt from the requirements of the California Environmental Quality Act (CEQA). A brief explanation of this determination is provided below. CARB's regulatory program, which involves the adoption, approval, amendment, or repeal of standards, rules, regulations, or plans for the protection and enhancement of the State's ambient air quality, has been certified by the California Secretary for Natural Resources under Public Resources Code section 21080.5 of CEQA (14 CCR 15251(d)). Public agencies with certified regulatory programs are exempt from certain CEQA requirements, including but not limited to, preparing environmental impact reports, negative declarations, and initial studies. CARB, as a lead agency, prepares a substitute environmental document (referred to as an "Environmental Analysis" or "EA") as part of the report prepared for a proposed action to comply with CEQA (17 CCR 60000-60008). If the proposed measure is approved, a Notice of Exemption will be filed with the Office of the Secretary for the Natural Resources Agency and the State Clearinghouse for public inspection.

CARB has determined that the proposed measure is not a “project” subject to CEQA because it constitutes the creation of a government funding mechanism or other government fiscal activities which do not involve any commitment to any specific project which may result in a potentially significant physical impact on the environment.

The proposed measure would demonstrate that the South Coast Incentive Measure committed to in the State SIP Strategy meets the U.S. EPA requirements of a SIP measure, and includes an enforceable commitment to turnover 1,300 on-road trucks to cleaner technologies and achieve one tpd emission reductions of NOx. This measure was developed to quantify and incorporate SIP benefits from the use of existing funds. These existing funds will incentivize upgrades to captive fleets operating in the Basin, such as solid waste collection vehicles and drayage trucks. These existing funds are sourced from the Moyer Program as described in Section II *Funding and Legal Authority for the South Coast Incentive Measure*. The Moyer Program has a legislatively-authorized statewide funding level of \$69 million per year from smog abatement and tire fees until 2023. Funding allocation levels are based on population and air pollution severity under the requirements of Health and Safety Code section 44299.2.

CARB develops the Moyer Program guidelines for districts while districts fund and implement the projects. If the District determines that projects other than solid waste and drayage trucks are necessary or more cost-effective to meet the emission reduction commitment, CARB will submit substitute measures that meet U.S. EPA requirements and achieve the emission reductions. The associated emission reductions from this measure will contribute towards CARB’s aggregate emission reduction commitment in the State SIP Strategy.

VIII. Staff Recommendation

This document demonstrates that the emission reductions from the South Coast Incentive Measure meet U.S. EPA guidelines for SIP-creditable emissions reductions. Therefore, CARB staff recommends that the Board:

1. Adopt the South Coast Incentive Measure as a revision to the California SIP.
2. Direct the Executive Officer to submit the South Coast Incentive Measure to U.S. EPA as a revision to the California SIP.

Appendix A

South Coast Incentive Measure

Methodology and Sample Calculations

The 2017 Guidelines include the methodology for calculating project emission reductions such as emission reduction equations, emission factors, and deterioration rates and the amount of incentive funds available per project. For this measure, refuse truck repower projects are assumed to be funded up to the maximum amount of \$40,000 and all replacement projects are assumed to be funded up to the maximum amount of \$100,000 per project. Since staff assumed the maximum amount of funding per vehicle, the estimated number of projects and estimated emission reductions that can be achieved are conservative.

Approximately \$30 million per year of Moyer Program funding including the District's local matching funds is available in the Basin. The South Coast Incentive Measure will use funds available from 2019 through 2022, for a total of approximately \$120 million. Additional information about the method used to calculate prospective emission reductions is in the **V. Quantifiable** section of this measure. Example 1 shows how CARB staff prospectively calculated the emission reductions associated with future projects for one project type. Example 2 highlights how emission reductions will be calculated once projects have been actually implemented.

The percent operation of the vehicle in the District is reported and included in the emission reduction calculation. This ensures credit is given for emission reductions actually occurring in the District. Example 1 and 2 below include captive fleets in the Basin so the equipment operates solely in the District; therefore, 100 percent of the total emission reductions are credited.

As highlighted throughout this document, emission reductions accounted for in this measure will be reductions from drayage trucks that are cleaner than the current 2010 Engine Standard and required by the Truck and Bus Regulation. Likewise, eligible refuse truck reductions are the difference between the baseline engine model year to the Low NOx standard due to the exemption from the Truck and Bus Regulation.

Example 1 – Calculating Estimated Project Emission Reductions

To estimate the emission reductions for this measure, different calculations are needed for drayage trucks and refuse trucks due to distinct regulatory requirements. For drayage trucks, emission reductions are calculated by subtracting the difference between emissions from the current 2010 Engine Standard and the Low-NOx engine standard. The result is multiplied by activity estimated for each model year and population data from EMFAC2014⁶. While the refuse trucks are calculated by

⁶ <https://www.arb.ca.gov/emfac/2014/>

multiplying the difference between emissions from the current engine model year and the Low-NOx engine standard by each model year activity and population data from EMFAC2014. Since refuse trucks and drayage trucks are captive fleets operating in the Basin, staff apportioned the emission reductions based on the percent operation in the District at 100 percent.

Example 1 calculates how staff estimated an individual project using formulas⁷ and emissions factors⁸ found in Appendix C and D of the 2017 Guidelines, respectively. This estimated calculation allowed CARB staff to identify and commit to turning over 1,300 on-road, heavy-duty vehicles and achieve one tpd of NOx reductions. The estimated emission reductions for this measure were calculated according to the 2017 Guideline methodology using CARB's EMFAC2014 activity and population data. EMFAC2014 identifies activity and population data for engine model years including pre-2010 engines, which are assumed to be dirtier than the 2010 Engine Standard, in the refuse and drayage truck sub-categories. Sub-category activity and population data was generated from EMFAC2014 for each year between 2019 and 2022 since projects implemented in these years will have a five-year project life that spans the entire 2023 calendar year. The activity and population data was generated annually over the four years to account for natural turnover and to identify pre-2010 vehicles or engines for replacement.

In the example, an applicant will scrap a 2008 engine model year diesel-powered drayage truck and replace it with a new drayage truck equipped with a 2019 engine model year compressed natural gas (CNG) engine certified to a 0.02 g/bhp-hr NOx standard. Emission rates for all refuse trucks will be based on Table D-5: *Diesel Refuse Trucks Emission Factors* and emission rates for other heavy heavy-duty trucks, including drayage trucks, will be based on Table D-2: *Heavy-Duty Vehicles Over 33,000 GVWR Emission Factors*. Emission reductions from pre-2010 drayage truck engines are not surplus, therefore, only emission reductions above the 0.2 g/bhp-hr NOx level will be calculated and the baseline engine model year is assumed to be the same as the replacement engine model year.

For calculating estimated refuse truck emission reductions use Step 1 and 2 from Example 2 below. Refuse trucks include an addition step because 2006 and older engines models have surplus NOx emissions. As stated above, estimated refuse truck emission reductions use CARB's EMFAC2014 activity and population data as inputs to the 2017 Guideline formulas. Note that when calculating refuse trucks there are no deterioration rates included in the 2017 Guidelines due to assumptions made in EMFAC2014 and because large fleets, such as solid waste companies, maintain their fleets on a regular basis.

⁷ Formula C-5: *Estimated Annual Emissions Based on Mileage using Emissions Factors*

⁸ Table D-2: *Heavy-Duty Vehicles over 33,000 pounds (lbs.) GVWR Emission Factors* and Table D-5: *Diesel Refuse Trucks Emission Factors*

Note: Calculations may not add up due to rounding

EMFAC2014 reference data and inputs

Region: South Coast AQMD

Calendar Year: 2019

Vehicle Class: T7 POLA

Model Year: 2008 (Engine Model Year (EMY) 2013+ emission rates⁹)

Speed: Aggregated

Fuel: DSL

Population: 2,003

VMT: 295,534 miles/day

(a) Determine deterioration calculations for an EMY 2013+ 0.20 NOx to EMY 2019
0.02 NOx:

Formula C-5: Estimated annual emissions based on mileage (tons/year)

*Annual emissions by pollutant (tons/yr) = (emission factor (grams/mile) + deterioration product (grams/mi)) * annual activity (miles/year) * percentage operation in South Coast AQMD / 907,200 (grams/ton)*

(1) Calculate deterioration life (baseline equipment) (years):

Deterioration life (baseline equipment) (years) = expected first year of operation – baseline engine model year + (project life / 2)

Deterioration life (baseline equipment) = 2019 – 2019 + (5 / 2) = 2.5 years

(2) Calculate deterioration life (reduced equipment) (yrs.):

Deterioration life (reduced equipment) (years) = project life / 2

Deterioration life (reduced equipment) = 5 / 2 = 2.5 years

(3) Calculate miles per day per vehicle from EMFAC2014 (miles/day)

(miles/day/vehicle) = (miles/day) / (vehicle population)

295,534 mi/day / 2,003 vehicles = 147.546 miles/day/vehicle

(4) Calculate annual activity(VMT) from EMFAC2014 (mi/year)

*(miles/year/vehicle) = (miles/day/vehicle) * (365 days/1 year)*

147.546 miles/day * 365 days/year = 53,854 miles/year

⁹ 2013+ is used as reference to the 2017 Guidelines emissions factor Table D-2 and is also assumed as the baseline engine to meet the surplus requirements beyond the Truck and Bus Regulation.

(5) Calculate total equipment activity and cap the baseline equipment activity when applicable (mi):

*Total equipment activity (miles) = annual activity (miles/year) * deterioration life (years)*

Total baseline equipment activity = 53,853 (mi/year) * 2.5 (years) =
134,632 miles

Total reduced equipment activity = 53,853 (miles/year) * 2.5 (years) =
134,632 miles

(6) Calculate deterioration product for baseline and reduced equipment, for each pollutant (grams/mile):

*Mile-based deterioration product (grams/mile) = deterioration rate (grams/mile-10,000 mi) * total equipment activity (mile)*

Baseline equipment:

NOx deterioration product = (0.039 grams/mile) (grams/mile-10,000 mile) *
134,632 (mile) = 0.53 grams/mile

Reduced equipment:

NOx deterioration product = (0.004 grams/mile) (grams/mile-10,000 miles) *
134,632 (miles) = 0.05 grams/mile

(b) Determine emission reductions calculations for an EMY 2013+ 0.20 NOx to EMY 2019 0.02 NOx:

(1) Calculate the estimated annual emissions for baseline and reduced equipment, for each pollutant (tons/year):

Formula C-5: Estimated annual emissions based on mileage (tons/year):
*Annual emissions by pollutant (tons/year) = (emission factor (grams/mile) + deterioration product (grams/mile)) * annual activity (mile/year) * percentage operation in South Coast AQMD / 907,200 (grams/ton)*

Annual NOx **baseline** technology emissions (tons/year)
(1.76 (g/mi) + 0.53 (g/mi)) * 58,853 (mi/year) * 100% / 907,200 (g/ton)
= 0.1486 tons/year

Annual NOx **reduced** technology emissions (tons/year)
(0.18 (grams/mile) + 0.05 (grams/mile)) * 58,853 (miles/year) * 100% /
907,200 (grams/ton)
= 0.0149 tons/year

(2) Calculate annual surplus emission reductions for each pollutant (tons/year):

Formula C-9: Annual surplus emission reductions (tons/year)
Annual surplus emission reductions by pollutant (tons/year) =
annual emissions for the baseline technology (tons/year) –
annual emissions for the reduced technology (tons/year)

Annual NO_x surplus emission reductions (tons/year)
= 0.1486 (tons/year) - 0.0149 (tons/year) = 0.1337 tons/year

(c) Convert tons per year to tons per day
*(tons/day) = (tons/year) * (1 year/365 day)*

0.1337 tons/year * (year/365 day) = .0004 tons per day

Example 2 – Calculating Implemented Project Emission Reductions

Example 2 calculates an implemented individual project using formulas¹⁰ and emissions factors¹¹ found in Appendix C and D of the 2017 Guidelines, respectively. The data points will be included in reports to U.S. EPA that will be publicly available at <https://www.arb.ca.gov/planning/sip/imp2016sip/imp2016sip.htm>. The list of the data points can be found above in the **V. Quantifiable** section.

An applicant will scrap a 1990 engine model year diesel powered refuse truck and replace it with a new refuse truck equipped with a 2019 engine model year CNG engine certified to a 0.02 g/bhp-hr NO_x engine standard. The 1990 refuse vehicle must have a filter as per the SWCV Rule¹². Emission rates for all refuse trucks will be based on Table D-5: *Diesel Refuse Trucks Emission Factors (g/mile)* and other heavy heavy-duty trucks, including drayage trucks will be based on Table-D-2: *Heavy-Duty Vehicles Over 33,000 GVWR Emission Factors*. Note that refuse trucks do not include deterioration rates.

For calculating implemented drayage trucks, due to the current 2010 Engine Standard and the Truck and Bus Regulation, this measure will only account for emission reductions cleaner than the 2010 Engine Standard. Example 2 can be replicated for an implemented drayage truck project by following Step 2. Only Step 2 is necessary since the 2010 Engine Standard is the baseline technology for drayage trucks even though the baseline engine targeted is pre-2010. The current 2010 Engine Standard and Truck

¹⁰ Formula C-5: *Estimated Annual Emissions Based on Mileage*

¹¹ Table D-2: *Heavy-Duty Vehicles over 33,000 pounds (lbs.) GVWR Emission Factors*

¹² A refuse truck must be compliant with the Solid Waste Collection Vehicle Rule to be eligible for Moyer Program funding.

2017 Moyer Program, Volume I, Chapter 2: General Criteria, D.

and Bus Regulation associated emission reductions have already been credited towards the SIP.

This project is eligible for a two-step cost-effectiveness calculation.

Step 1 – EMY 1990 to EMY 2010+ 0.20 g/bhp-hr NOx standard

Step 2 – EMY 2010+ 0.20 g/bhp-hr NOx standard to EMY 2019 0.02 g/bhp-hr NOx standard

Note: Calculations may not add up due to rounding

Hypothetical data and inputs

Calendar Year: 2019

Vehicle Class: Refuse Truck

Model Year: 1990

Vehicle Miles Travelled: 16,000 miles/year

Step 1

(a) Determine deterioration calculations for a EMY 1990 to EMY 2010+ 0.20 NOx
(NOTE: REFUSE TRUCKS DO NOT HAVE DETERIORATION RATE)

Formula C-5: Estimated annual emissions based on mileage (tons/year)

*Annual emissions by pollutant (tons/year) = (emission factor (grams/mile) + deterioration product (grams/mile)) * annual activity (miles/year) * percentage operation in South Coast AQMD / 907,200 (grams/ton)*

(1) Calculate deterioration life (baseline equipment) (years):

Deterioration life (baseline equipment) (years) = expected first year of operation – baseline engine model year + (project life/ 2)

Deterioration life (baseline equipment) = 2019 – 1990 + (5 / 2) = 31.5 years

(2) Calculate deterioration life (reduced equipment) (years):

Deterioration life (reduced equipment) (years) = project life / 2

Deterioration life (reduced equipment) = 5 / 2 = 2.5 years

(3) Calculate total equipment activity and cap the baseline equipment activity when applicable (mi):

*Total equipment activity (miles) = annual activity (miles/year) * deterioration life (years)*

Total baseline equipment activity = 16,000 (miles/year) * 31.5 (years) =
504,000 miles

Total reduced equipment activity = 16,000 (miles/year) * 2.5 (years) =
40,000 miles

(4) Calculate mile-based deterioration product for baseline and reduced equipment, for each pollutant (grams/mile):

*Mile-based deterioration product (grams/mile) = deterioration rate (grams/mile-10,000 mile) * total equipment activity (mile)*

Baseline equipment:

NOx deterioration product = (NO RATE) (grams/mile-10,000 mile) *
504,000 (miles) = 0 grams/mile

Reduced equipment:

NOx deterioration product = (NO RATE) (grams/mile-10,000 mile) * 40,000 (mile)
= 0 grams/mile

**(b) Determine emission reductions calculations for a EMY 1990 to EMY 2010+
0.20 NOx engine:**

(1) Calculate the estimated annual emissions for baseline and reduced equipment, for each pollutant (tons/year):

Formula C-5: Estimated annual emissions based on mileage (tons/year)
*Annual emissions by pollutant (tons/year) = (emission factor (grams/mile) + deterioration product (grams/mile)) * annual activity (miles/year) * percentage operation in South Coast AQMD / 907,200 (grams/ton)*

Annual NOx **baseline** technology emissions (tons/year)
(34.69 (grams/mile) + 0 (grams/mile)) * 16,000 (miles/year) * 100% / 907,200 (grams/ton)
= 0.6118 tons/year

Annual NOx **reduced** technology emissions (tons/year)
(1.09 (grams/mile) + 0 (grams/mile)) * 16,000 (miles/year) * 100% / 907,200 (grams/ton)
= 0.0192 tons/year

(2) Calculate annual surplus emission reductions for each pollutant (tons/year):

Formula C-9: Annual surplus emission reductions (tons/year)
Annual surplus emission reductions by pollutant (tons/year) =
annual emissions for the baseline technology (tons/year) –
annual emissions for the reduced technology (tons/year)

Transaction 1: Annual NO_x surplus emission reductions (tons/year) =
0.6118 (tons/year) - 0.0192 (tons/year) = 0.5926 tons/year

Step 2

(c) Determine deterioration calculations for a EMY 2010+ 0.20 NO_x engine to EMY 2019 0.02 NO_x engine:

Formula C-5: Estimated annual emissions based on mileage (tons/year)
Annual emissions by pollutant (tons/year) = (emission factor (grams/mile) +
*deterioration product (g/mi)) * annual activity (mi/year) **
percentage operation in South Coast AQMD / 907,200 (g/ton)

(1) Calculate deterioration life (baseline equipment) (years):

Deterioration life (baseline equipment) (years) = expected first year of operation –
baseline engine model year + (project life / 2)

Deterioration life (baseline equipment) = 2019 – 2019 + (5 / 2) = 2.5 years

(2) Calculate deterioration life (reduced equipment) (years):

Deterioration life (reduced equipment) (years) = project life / 2

Deterioration life (reduced equipment) = 5 / 2 = 2.5 years

(3) Calculate total equipment activity and cap the baseline equipment activity when applicable (miles):

*Total equipment activity (miles) = annual activity (miles/yr) * deterioration life*
(years)

Total baseline equipment activity = 16,000 (miles/year) * 2.5 (years) = 40,000 mi

Total reduced equipment activity = 16,000 (miles/year) * 2.5 (years) = 40,000 mi

(4) Calculate deterioration product for baseline and reduced equipment, for each pollutant (grams/mile):

Mile-based deterioration product (grams/mile) = deterioration rate
*(grams/mile-10,000 mi) * total equipment activity (mile)*

Baseline equipment:

NOx deterioration product = (NO RATE) (grams/mile-10,000 mile) *
40,000 (miles) = 0 grams/mile

Reduced equipment:

NOx deterioration product = (NO RATE) (grams/mile-10,000 mile) *
40,000 (miles) = 0 grams/mile

(d) Determine emission reductions calculations for a EMY 2010+ 0.20 NOx engine to EMY 2019 0.02 NOx engine:

(1) Calculate the estimated annual emissions for baseline and reduced equipment, for each pollutant (tons/year):

Formula C-5: Estimated annual emissions based on mileage (tons/year):
*Annual emissions by pollutant (tons/year) = (emission factor (grams/mile) + deterioration product (grams/mi)) * annual activity (miles/year) * percentage operation in South Coast AQMD / 907,200 (grams/ton)*

Annual NOx **baseline** technology emissions (tons/year)
(1.09 (grams/mile) + 0 (grams/mile)) * 16,000 (miles/year) *
100% / 907,200 (grams/ton)
= 0.0192 tons/yr

Annual NOx **reduced** technology emissions (tons/year)
(0.11 (grams/mile) + 0 (grams/mile)) * 16,000 (miles/year) *
100% / 907,200 (grams/ton)
= 0.0019 tons/yr

(2) Calculate annual surplus emission reductions for each pollutant (tons/yr):

Formula C-9: Annual surplus emission reductions (tons/year)
Annual surplus emission reductions by pollutant (tons/year) = annual emissions for the baseline technology (tons/year) – annual emissions for the reduced technology (tons/year)

Transaction 2: Annual NOx surplus emission reductions (tons/year) =
0.0192 (tons/year) - 0.0019 (tons/year) = 0.0173 tons/year

(e) Determine the total NOx emission reductions for total project life

Formula C-15: split project lives

*Total annual weighted surplus emission reductions (tons/year) = (fraction project life / total project life * annual weighted surplus emission from transaction 1) + (fraction project life / total project life * annual weighted surplus emission from transaction 2)*

Total annual NOx weighted surplus emission reductions =
0.5926 tons/year * (5 / 5) + 0.0173 tons/yr * (5 / 5) = **0.6099 tons/year**

(f) Convert tons per year to tons per day

*(tons/day) = (tons/year) * (1 year/365 day)*

0.6099 tons/year * (year/365 day) = .0017 tons per day

It is important to note in Example 2 above that the replaced engine is a 1990 model year engine which is dirtier than the 2010 Engine Standard. Pre-2007 refuse trucks are exempt from the Truck and Bus Regulation and are only subject to the SWCV Rule particulate matter requirements. As mentioned in the **III. Surplus** section all NOx emission reductions from the 1990 engine to the 2019 Low-NOx engine are creditable.



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